

CLAIMS

What is claimed is:

1. A plant comprising:

a first shift reactor and a second shift reactor, wherein the first shift reactor receives a first portion of a syngas from a gasification unit or a partial oxidation unit and forms a first shift reactor effluent; and

wherein the second shift reactor receives a combination of the first shift reactor effluent and a second portion of the syngas to form a second shift reactor effluent.
2. The plant of claim 1 wherein the second portion of the syngas is combined with the first shift reactor effluent in an amount effective to reduce steam demand by at least 10%.
3. The plant of claim 2 wherein the second portion of the syngas is combined with the first shift reactor effluent in an amount effective to reduce steam demand by at least 35%.
4. The plant of claim 1 further comprising a humidifier coupled to the first shift reactor, wherein the syngas is humidified in the humidifier before entering the first shift reactor, and wherein the second portion of the syngas is combined with the first shift reactor effluent in an amount effective to reduce water consumption of the humidifier by at least 20%.
5. The plant of claim 1 wherein the second portion has a volume of between 50 vol% to 75 vol% of the syngas from the gasification unit or partial oxidation unit.
6. The plant of claim 1 further comprising a bypass that combines a third portion of the syngas with the second shift reactor effluent.
7. The plant of claim 1 wherein the syngas includes carbon monoxide and hydrogen in a molar ratio of at least 2:1.

8. The plant of claim 1 further comprising an acid gas removal unit that is coupled to the second shift reactor and that removes carbon dioxide from the second shift reactor effluent.
9. A method of operating a plant, comprising:

providing a first shift reactor and a second shift reactor;

splitting a syngas from a gasification unit or a partial oxidation unit into a first portion and a second portion, and feeding the first portion to the first shift reactor to form a first shift reactor effluent;

combining the first shift reactor effluent with the second portion to form a mixed feed gas, and reacting the mixed feed gas in the second shift reactor to form a second shift reactor effluent; and

wherein the second portion is combined with the first shift reactor effluent in an amount effective to reduce steam consumption in the first and second shift reactors.
10. The method of claim 9 wherein the second portion of the syngas is combined with the first shift reactor effluent in an amount effective to reduce steam demand by at least 10%.
11. The method of claim 9 wherein the second portion of the syngas is combined with the first shift reactor effluent in an amount effective to reduce steam demand by at least 35%.
12. The method of claim 9 wherein the second portion has a volume of between 50 vol% to 75 vol% of the syngas from the gasification unit or partial oxidation unit.
13. The method of claim 9 further comprising providing a bypass that combines a third portion of the syngas with the second shift reactor effluent.
14. The method of claim 9 wherein the syngas includes carbon monoxide and hydrogen in a molar ratio of at least 2:1.

15. The method of claim 9 further comprising coupling an acid gas removal unit to the second shift reactor, and removing carbon dioxide from the second shift reactor effluent in the acid gas removal unit.